

Serial No. 09/539,691
September 9, 2003
Response to Office Action of March 12, 2003
Page 6

REMARKS

Claims 19-31 are pending in this application. By this amendment, Applicants cancel claims 5-10 and add new claims 19-31.

Claims 5, 7, 8 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakazawa et al. (U.S. 5,948,200) in view of Funami et al. (U.S. 5,055,653). In addition, Claims 5, 7, 8 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakazawa et al. in view of JP 10-034365 (JP '365) and Funami et al. Claim 6 was rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '365 in view of Nakazawa et al. and Funami et al. Furthermore, claim 6 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Wang (U.S. 5,293,025) in view of JP '365 and Funami et al. Claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakazawa et al. in view of Funami et al., and further in view of Derwent 1988-159505 (Derwent). And finally, claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakazawa et al. in view of JP '365, and further in view of Funami et al. and Derwent. Applicants respectfully traverse these prior art rejections.

Claim 19 recites:

"A method for processing a ceramic green sheet to form a plurality of through holes in the ceramic green sheet, comprising the steps of:

(a) disposing a laser source for emitting a pulsed laser beam, a **diffraction grating for splitting the laser beam into a plurality of laser beam components** in the vicinity of the laser source, a galvano-scan mirror that reflects the laser beam components at a reflection angle, a converging lens that individually converges the laser beam components reflected by the galvano-scan mirror, and the ceramic green sheet, in a predetermined positional relationship;

(b) **splitting the pulsed laser beam emitted from the laser source through the diffraction grating into the plurality of laser beam components;**

(c) reflecting the plurality of laser beam components with the galvano-scan mirror toward the ceramic green sheet such that a plurality of through holes is simultaneously formed at predetermined locations of the ceramic green sheet;

(d) varying the reflection angle of the galvano-scan mirror to repeat said step (c) until the through holes are formed in an entire

Serial No. 09/539,691
September 9, 2003
Response to Office Action of March 12, 2003
Page 7

region that can be processed by such a variation of the reflection angle in the ceramic green sheet;

(e) shifting the ceramic green sheet by a predetermined distance and repeating said steps (c) and (d); and

(f) repeating said step (e) until the through holes are formed at all predetermined locations of the ceramic green sheet.” (Emphasis added)

Claims 24 and 28 recite method steps and features that are similar to the method steps and features recited in claim 19, including the emphasized method steps and features.

The Examiner alleged that Nakazawa et al. teaches all of the method steps and features recited in the present claimed invention, except for a converging lens to individually converge a plurality of beams. Particularly, the Examiner alleged that Nakazawa et al. teaches “passing said laser beam through a transparent mask (8) (diffraction grating) to form a plurality of beams (see col. 7, lines 30-35)” and “reflecting said plurality of beams off a galvano-mirror (9) having two degrees of freedom and simultaneously irradiating said ceramic green sheet (5) to form a plurality of holes (feed-through holes) (SH) (see col. 7, lines 3-35 and Figure 4).” Applicants respectfully disagree.

In contrast to the Examiner’s allegations, Nakazawa et al. teaches, in col. 7, lines 10-15, that a laser beam is passed through “a light transmitting portion [8] corresponding to the **though hole** such as, for example, a glass mask having a transparent or semi-transparent portion, a **hole** or the like which permits the transmission of light rays from laser 7” (emphasis added). Thus, at best, Nakazawa et al. (as disclosed in col. 7, lines 10-15 and shown in Fig. 4) teaches that the light transmitting portion 8 includes only a single hole which corresponds to the through hole to be formed in the ceramic green sheet, and clearly fails to teach or suggest any plurality of laser beam components, let alone a diffraction grating for splitting a laser beam. Thus, Nakazawa et al. certainly fails to teach or suggest a “diffraction grating for splitting the laser beam into a plurality of laser beam components” (emphasis added) as recited in the present claimed invention.

Serial No. 09/539,691
September 9, 2003
Response to Office Action of March 12, 2003
Page 8

In addition, in contrast to the present claimed invention and the Examiner's allegation, Nakazawa et al. teaches that the through holes SH are individually formed by a single laser beam which is directed by the galvano-mirror 9 which has two degrees of freedom, and NOT that a plurality of through holes are formed simultaneously. Thus, contrary to the Examiner's allegation, Nakazawa et al. clearly fails to teach or suggest the steps of "splitting the pulsed laser beam emitted from the laser source through the diffraction grating into the plurality of laser beam components" and "reflecting the plurality of laser beam components with the galvano-scan mirror toward the ceramic green sheet such that a plurality of through holes is simultaneously formed at predetermined locations of the ceramic green sheet" as recited in the present claimed invention.

Furthermore, Nakazawa et al. fails to teach or suggest that the table 6 could or should be shifted, and certainly fails to teach or suggest the step of "shifting the ceramic green sheet by a predetermined distance and repeating said steps (c) and (d)" as recited in the present claimed invention. In fact, since the galvano-mirror 9 of Nakazawa et al. has two degrees of freedom which enables the laser beam to irradiate the ceramic green sheet 5 and form all of the desired through holes SH without shifting the table, there would have been absolutely no reason for the table 6 of Nakazawa et al. to be shifted.

The Examiner further alleged that Funami et al. teaches "converging said plurality of laser beams (2f) using convergent lenses 11." Thus, the Examiner concluded that it would have been obvious "to have provided converging lenses for individually converging a plurality of laser beams as taught by Funami et al. ('653) in the process of Nakazawa et al. ('200) because, Funami et al. ('653) specifically teaches that such lenses provide equal laser energy densities at the machining spots." Applicants respectfully disagree.

The present claimed invention recites "a converging lens that individually converges the laser beam components reflected by the galvano-scan mirror". Thus, the present claimed invention requires a single converging lens that converges a plurality

Serial No. 09/539,691
September 9, 2003
Response to Office Action of March 12, 2003
Page 9

of laser beam components. In contrast to the present claimed invention and the Examiner's allegations, Funami et al. teaches a plurality of converging lenses 11, each of which converges only a single laser beam component. None of the plurality of converging lenses 11 of Funami et al. converges a plurality of laser beam components. Thus, contrary to the Examiner allegations, Funami et al. certainly fails to teach or suggest the step of "disposing . . . a converging lens that individually converges the laser beam components reflected by the galvano-scan mirror" as recited in the present claimed invention.

In addition, even assuming *arguendo* that Funami et al. teaches or suggests a converging lens that individually converges the laser beam components reflected by the galvano-scan mirror as alleged by the Examiner, there would have been absolutely NO motivation to provide such a converging lens in the method of Nakazawa et al. since Nakazawa et al. teaches only a single laser beam component, NOT a plurality of laser beam components. Thus, there would have been absolutely no reason to provide a converging lens that individually converges a plurality of laser beam components in the method of Nakazawa et al. Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination. In re Geiger, 815 F.2d 686, 2 USPQ 1276, 1278 (Fed. Cir. 1987).

The Examiner further alleged that Wang teaches a process which includes the step of "irradiating said ceramic green sheet (23) to form a plurality of holes". Applicants respectfully disagree.

Similar to Nakazawa et al., Wang clearly and specifically teaches, in Fig. 1 and the associated disclosure, that two laser beams are combined to form a single laser beam B. Thus, contrary to the Examiner's allegation and the present claimed invention, Wang fails to teach or suggest the steps of "splitting the pulsed laser beam emitted from the laser source through the diffraction grating into the plurality of laser beam components" and "reflecting the plurality of laser beam components with the galvano-scan mirror toward the ceramic green sheet such that a plurality of laser beam components is

Serial No. 09/539,691
September 9, 2003
Response to Office Action of March 12, 2003
Page 10

simultaneously formed at predetermined locations of the ceramic green sheet" (emphasis added) as recited in the present claimed invention. At best, Wang teaches that only a single through hole is formed at any given time, and NOT that a plurality of through holes is simultaneously formed.

JP '365 was relied upon to allegedly teach forming a plurality of holes in a plate using a phase grating. However, JP '365 clearly fails to teach or suggest the steps of "reflecting the plurality of laser beam components with the galvano-scan mirror toward the ceramic green sheet such that a plurality of through holes is simultaneously formed at predetermined locations of the ceramic green sheet" and "varying the reflection angle of the galvano-scan mirror to repeat said step (c) until the through holes are formed in an entire region that can be processed by such a change of the reflection angle in the ceramic green sheet" as recited in the present claimed invention.

Derwent was relied upon merely to allegedly teach a CO₂ laser, and certainly fails to teach or suggest the steps of "splitting the pulsed laser beam emitted from the laser source through the diffraction grating into the plurality of laser beam components," "reflecting the plurality of laser beam components with the galvano-scan mirror toward the ceramic green sheet such that a plurality of through holes is simultaneously formed at predetermined locations of the ceramic green sheet" and "varying the reflection angle of the galvano-scan mirror to repeat said step (c) until the through holes are formed in an entire region that can be processed by such a variation of the reflection angle in the ceramic green sheet" as recited in the present claimed invention.

Thus, Applicants respectfully submit that JP '365 and Derwent fail to cure the deficiencies of Nakazawa et al. and Wang as described above.

Accordingly, Applicants respectfully submit that Nakazawa et al., Funami et al., Wang, JP '365 and Derwent, applied alone or in combination, fail to teach or suggest the unique combination of method steps and features recited in claims 19, 24 and 28 of the present application.

In view of the foregoing amendments and remarks, Applicants respectfully submit

Serial No. 09/539,691
September 9, 2003
Response to Office Action of March 12, 2003
Page 11

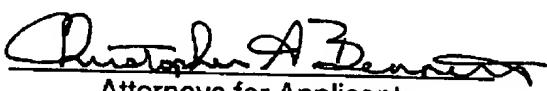
that Claims 19, 24 and 28 are allowable over the prior art for the reasons described above. Claims 20-23, 25-27 and 29-31 are dependent upon Claims 19, 24 and 28, and are therefore allowable for at least the reasons that Claims 19, 24 and 28 are allowable.

In view of the foregoing amendments and remarks, Applicants respectfully submit that this Application is in condition for allowance. Favorable consideration and prompt allowance are respectfully solicited.

To the extent necessary, Applicants petition the Commissioner for a Three-month extension of time, extending to September 12, 2003, the period for response to the Office Action dated March 12, 2003.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,


Christopher A. Bennett
Atorneys for Applicant

OFFICIAL

Date: September 9, 2003

Joseph R. Keating
Registration No. 37,368

Christopher A. Bennett
Registration No. 46,710

KEATING & BENNETT LLP
10400 Eaton Place, Suite 312
Fairfax, VA 22030
Telephone: (703) 385-5200
Facsimile: (703) 385-5080

RECEIVED
CENTRAL FAX CENTER
SEP 09 2003